STUDY OF EMPLOYMENT IN THE COMMUNICATIONS INDUSTRY

Communications Division
Ministry of Transportation and Communications

March 1986

D.A. FORD AND ASSOCIATES LTD.
Management Consultants

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EXECUTIVE SUMMARY

INTRODUCTION

Recent estimates indicate that the communications sector (telecommunications, telematics and other elements) accounted for approximately $16 billion, or five percent of Gross Domestic Expenditure. Of this amount, approximately half was accounted for by the purchase of communications services, while the remainder was capital expenditures for equipment to provide the services. Capital expenditures in the telecommunications sub-sector amounted to $2.1 billion, while telematics accounted for $3.6 billion.

A study conducted by the Federal Department of Communications regarding the demand for telecommunications equipment in Canada established that of this expenditure of $2.1 billion, operating companies spent approximately $1.4 billion for the purchase of telecommunications equipment. Of this $1.4 billion, 76 percent was for network equipment (switching, transmission and outside plant), while the remaining 24 percent was for terminal equipment. In addition, the study found that products manufactured in Canada accounted for more than 90 percent of these purchases.

In summary, the purchase of telecommunications goods and services represents a substantial expenditure. The telecommunications carriers are by far the largest consumers, and the products they purchase have a high degree of Canadian content.

FINDINGS OF THE STUDY

The telecommunications industry is a major employer for both Canada and Ontario. During the past decade, employment by the telecommunications carrier industry in Canada, including the telephone companies, CNCP Telecommunications, Telesat Canada, Teleglobe Canada, the radio common carriers, the cellular industry, the interconnect industry, and contract construction labour, has grown from 110 thousand in 1975 to over 130 thousand

in 1982, declining slightly to the present. In Ontario, the growth has been even stronger, increasing from just over 30 thousand in 1975 to almost 43 thousand in 1982.

The telecommunications industry in Canada is undergoing fundamental changes in its structure. While the threat of competition and technological changes are causing the conventional telecommunications carrier industry to reduce employment, other sectors of the industry are growing both in terms of employment and in terms of the range of services offered. For example, the interconnect industry now employs some 3,600 across Canada, of which approximately 2,200 are in Ontario. The cellular industry, which became operational in a few of the major population centers in 1985, now employs approximately five hundred.

Another significant change which has had an impact on employment in the telecommunications carrier industry is the tendency of major users to manage their own facilities. Combined with the internal integration of voice and data services, major users employ technical and management experts in the telecommunications field to plan, operate and maintain the wide range of voice and data services which they use, and to interface with employees of the telecommunications carriers. We estimate that total employment by users across Canada is approximately five thousand, of which about two thousand are in Ontario.

The telecommunications equipment manufacturing industry has also experienced continued growth over the decade. For Canada, employment increased from some 36 thousand in 1975 to almost 48 thousand in 1984, while the corresponding numbers for Ontario were 22 thousand and 29 thousand.

Other segments of the communications industry include the Radio and TV Broadcasting and the Cable TV industries. Combined employment for these sectors at the national level increased by almost 50 percent, from 31 thousand in 1975 to 46 thousand in 1984. For Ontario, the growth was even stronger, from 11 thousand in 1975 to over 18 thousand in 1984.

OVERVIEW OF HISTORICAL EMPLOYMENT DATA

The Canadian telecommunications industry, for purposes of this study, was defined as the regulated telecommunications carriers, the radio common carriers (RCCs), cellular and other mobile service providers, enhanced service providers, the manufacturers and distributors of voice and data telecommunications equipment for use by carriers (both terrestrial and satellite) and subscribers, and the terminal supply and service, or interconnect, industry. Also included in our study were related segments of the communications industry, including the cable television industry and the radio and TV broadcasting industry.

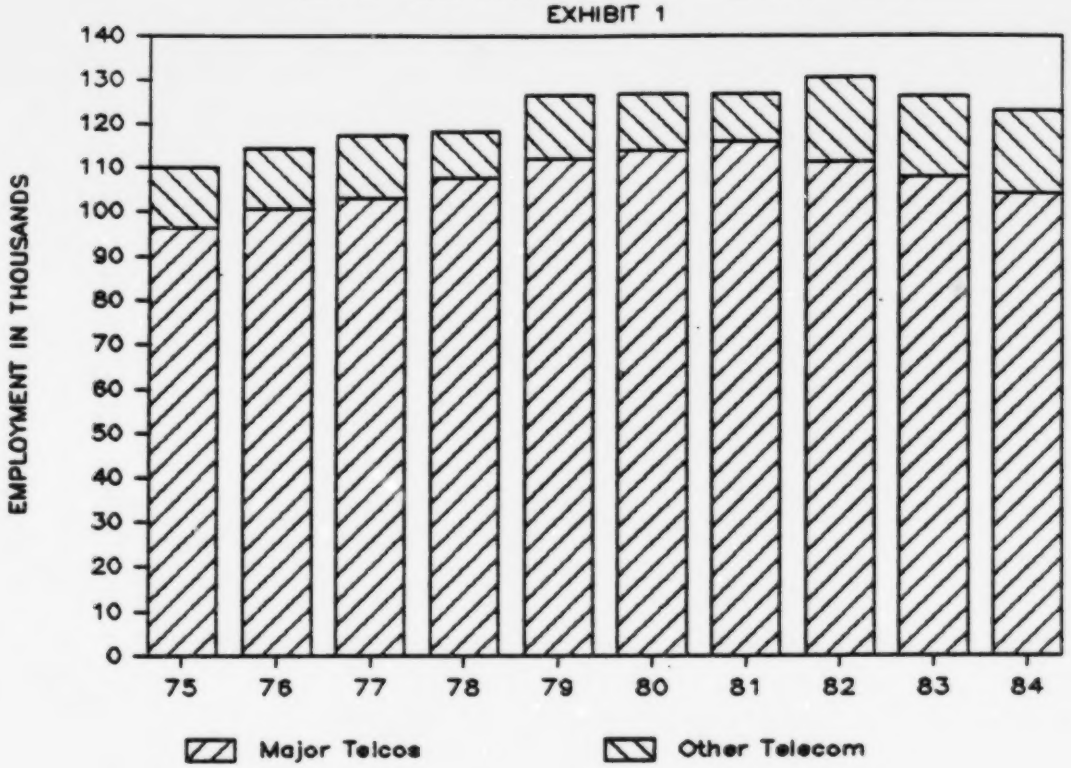
Summary of Historical Employment Data

The historical employment data which we regard as being representative of the 1975-1984 period is provided in graphical form in Exhibits 1 through 4, overleaf. Exhibit 1 indicates that the Canadian telecommunications industry currently employs approximately 123 thousand, including employees of the carriers, the radio common carriers, the interconnect companies, cellular carriers and construction which is contracted out by the carriers. At the Ontario level, Exhibit 3 indicates employment of approximately 40 thousand, or one third of the national total, in this narrow definition of the telecommunications industry.

The member companies of Telecom Canada account for the majority of the employees in this sector at the national level. Of the 123 thousand employees in 1984, over 92 thousand were employed by these nine carriers. In Ontario, Bell Canada accounts for approximately 75% of the employees in this sector, with Telesat Canada, CNCP, Northern Telephone, the other independent telephone companies in Ontario, the radio common carriers, the cellular carriers, the interconnect companies and outside contractors making up the balance.

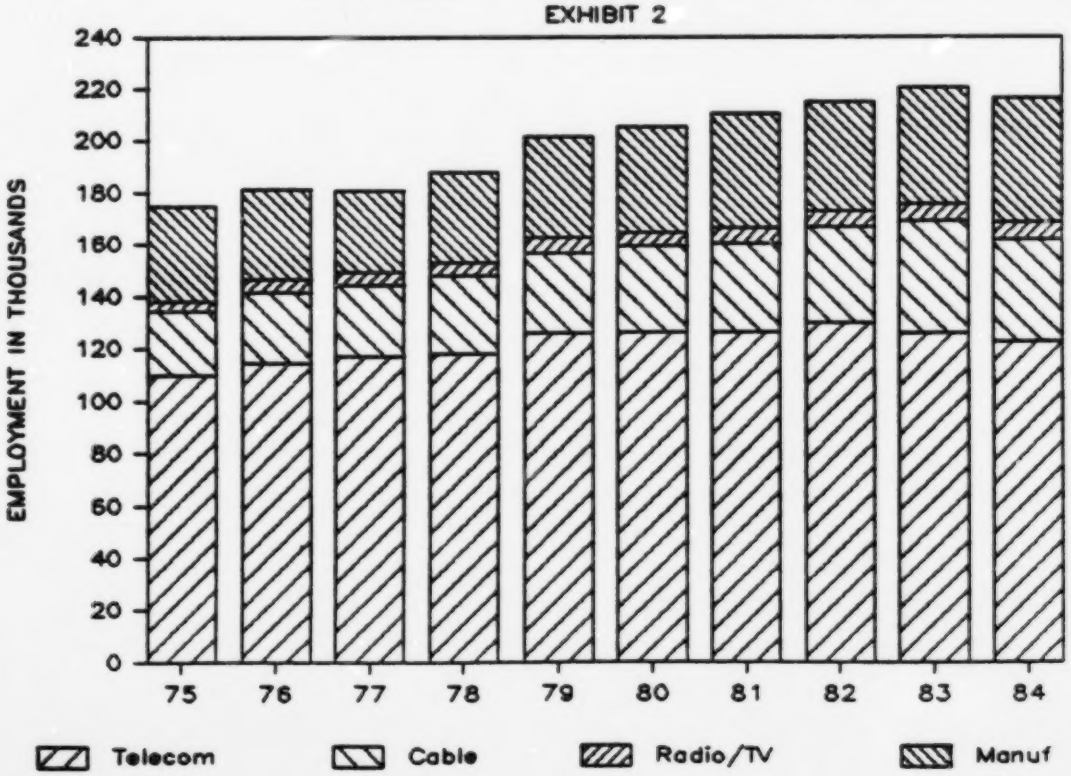
EMPLOYMENT — CANADA

EXHIBIT 1



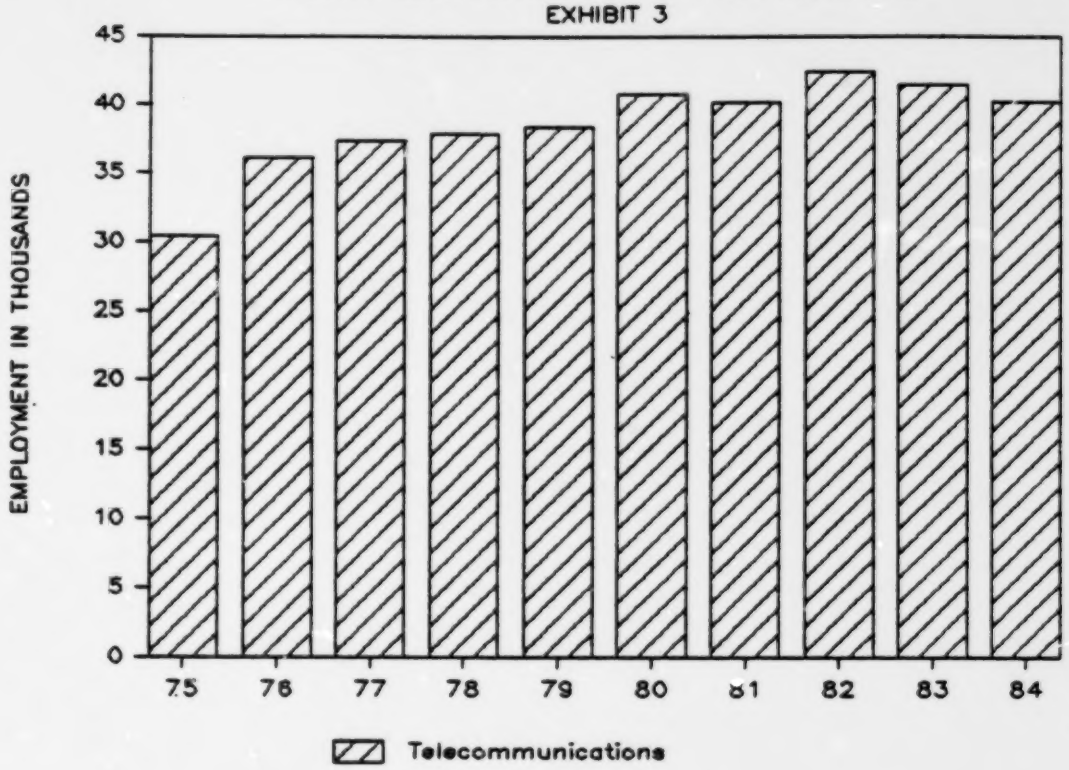
EMPLOYMENT — CANADA

EXHIBIT 2



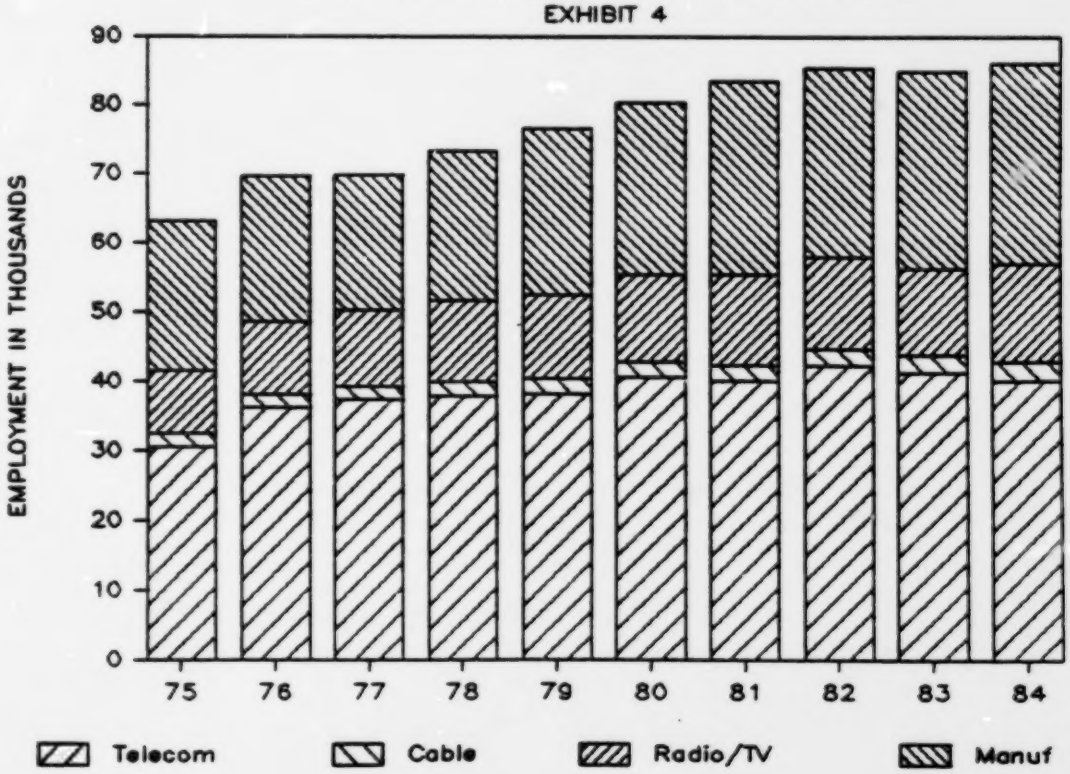
EMPLOYMENT — ONTARIO

EXHIBIT 3



EMPLOYMENT — ONTARIO

EXHIBIT 4



Taking a broader view of the definition of the industry, Exhibit 2 places the telecommunications industry in the perspective of the telecommunications manufacturing sector and the cable television, radio and TV broadcasting industries. The manufacturing sector includes a broad range of firms. Northern Telecom, Microtel and Mitel are the largest, but the industry includes a large number of small firms as well. This broader definition of the telecommunications industry encompasses 216 thousand employees at the national level, of which 86 thousand, or 40 percent, are in Ontario. All the major manufacturers of telecommunications equipment have manufacturing facilities in Ontario. Exhibit 4 illustrates the makeup of the Ontario communications industry.

Exhibits 5, 6 and 7, overleaf, provide useful views of employment in the telecommunications industry. Exhibit 5 depicts the proportion of total industry employment which is provided by Ontario. Exhibit 6 shows the declining employment by the sixteen largest telecommunications carriers relative to the growth in total employment for Canada. This latter exhibit indicates that some basic changes are taking place within the telecommunications carrier industry. However, for the telecommunications industry as a whole, the change in relative employment is more cyclical, but also trending more strongly upwards, as Exhibit 7 illustrates.

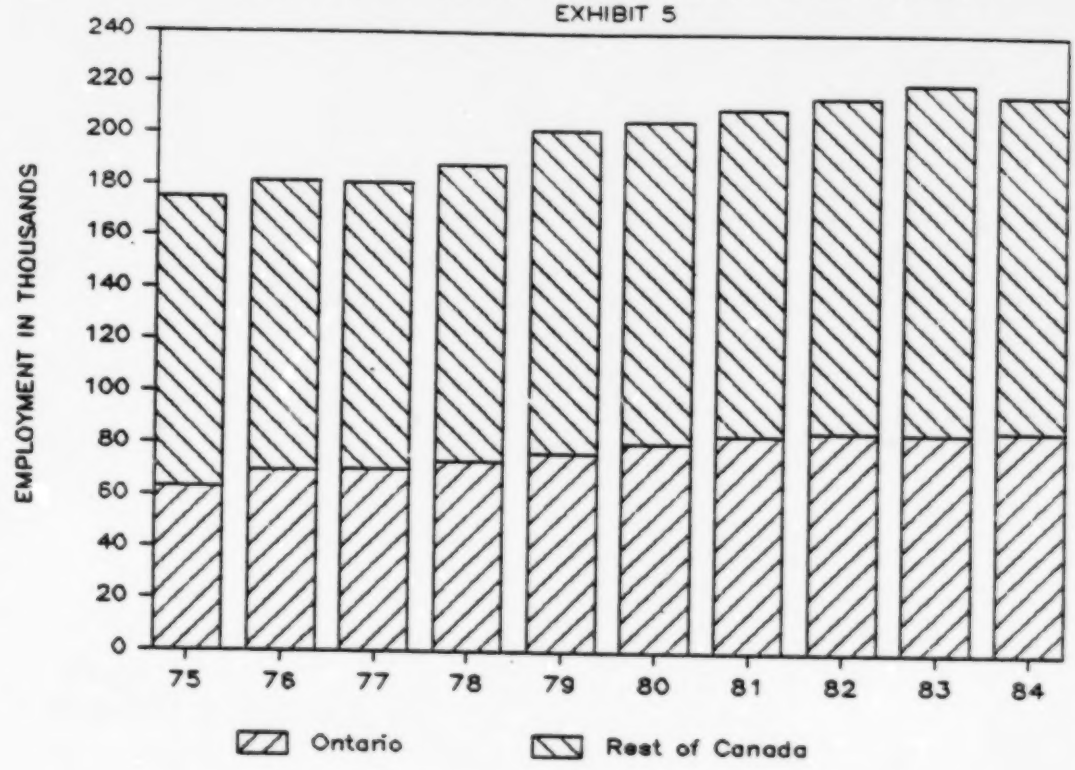
MAJOR INFLUENCES ON EMPLOYMENT

Three approaches were used in estimating the impacts of major policy and regulatory decisions and in identifying other factors which have affected employment during the period under review, including the development of predictive models, the use of a technique known as intervention analysis, and the use of a panel of experts each of whom has a unique perspective on the industry.

The factor which appeared through the modeling and intervention analysis to have had the most significant impact on telco employment during the historical review period was the construction program, specifically the Bell Canada Non-Urban Service Improvement (NUSI) Program. Interestingly, GNP was not

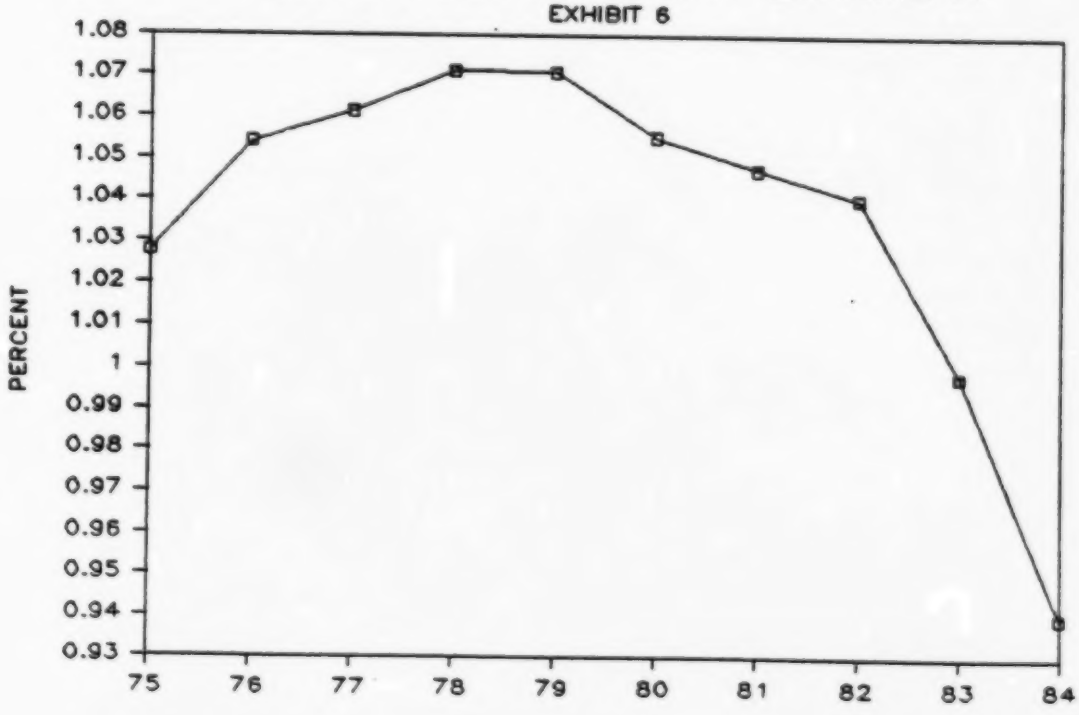
TOTAL INDUSTRY EMPLOYMENT

EXHIBIT 5



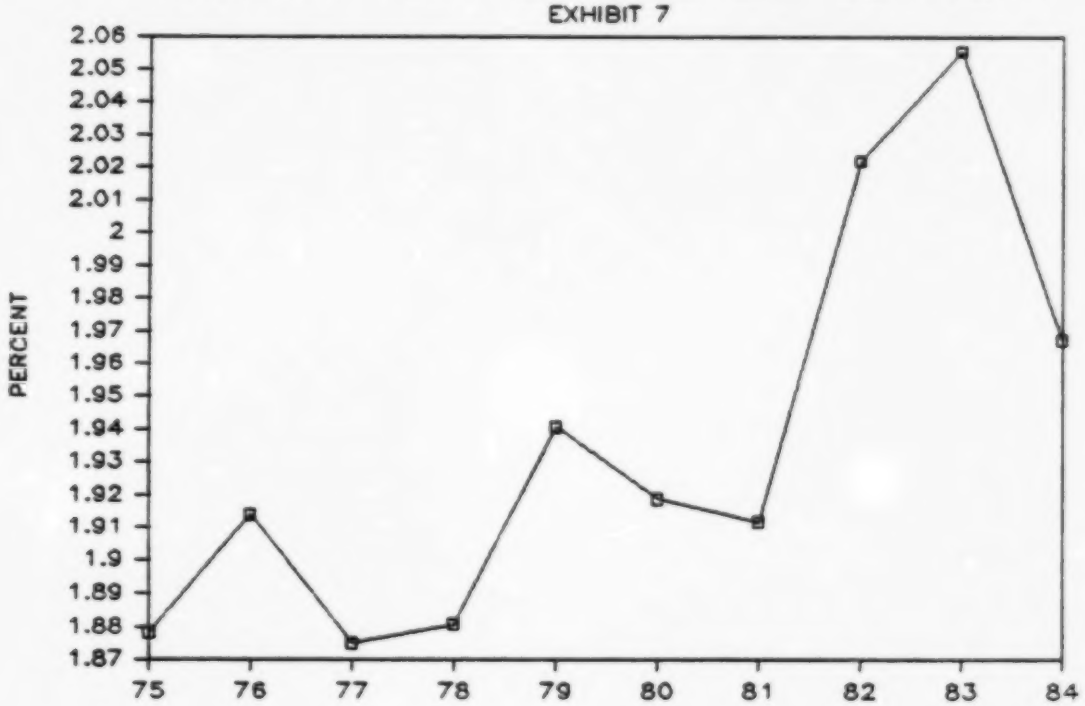
TELCO RELATIVE EMPLOYMENT

EXHIBIT 6



COMM. IND. RELATIVE EMPLOYMENT

EXHIBIT 7



significantly correlated with telco employment. For the combined cable TV, radio and television sector, there were no significant explanatory variables at the national level, but revenues and net plant were significantly correlated with employment at the Ontario level. For the manufacturing sector, employment was significantly correlated with revenues at the national level.

The panel of experts raised a large number of issues in explaining changes in employment over the decade. Those mentioned most often as causing an increase in employment were growth in demand and the range of services, increasing value of information and the terminal attachment decision. Decreases in employment were most often attributed to automation or improved efficiency, economic factors, interest rates and competition.

It is interesting to note that competition appears on both sides of the ledger in terms of its impact on employment. The CRTC's terminal attachment decisions, which created a competitive environment for the supply of terminal equipment in Ontario, Quebec and British Columbia, caused new firms to be created. These firms now employ some 3,600 nationally, 2,200 of which are in Ontario, and have total revenues of approximately $300 million. This industry was well developed prior to the decline in employment by the major carriers, which began in 1983. Therefore competition in terminal attachment appears to have had a positive impact on employment. However, competition or the threat of competition is also considered to have provided the motivation for carriers to implement major changes in technology and to seek productivity improvements, thus becoming more capital intensive and less labour intensive.

FORECAST OF EMPLOYMENT TRENDS

In examining employment trends, two approaches were used to estimate future trends. The first was an extension of the quantitative approach used to interpret the data. The second was a direct estimate by each of the members of the expert panel of future employment in the industry, both in Ontario and nationally.

The average of the statistical forecasts indicated significant increases in employment in all sectors of the communications industry over the 1985-1990 period, reaching a level of 259,000 at the end of the period for the Canadian industry. For Ontario, the 1990 employment figure was forecast to be 103,000. These represent increases over 1984 employment levels of 19 percent and 11 percent, respectively. By contrast, the panel of experts predicted, on average, a level of employment of 218,000 nationally and 94,000 for Ontario in 1990. Employment by the telecommunications industry was forecast to continue declining over the period, with increases taking place mainly in the manufacturing sector. Overall, the panel predicted a decline of 0.4 percent nationally, and an increase of 1.5 percent for Ontario.

Our own view, based on a review of historical trends, discussions with members of the panel, and our knowledge of the industry, is that the telecommunications carrier industry will become increasingly more capital intensive, and therefore less labour intensive. However, we feel that the major changes in technology which have a negative impact on employment have already been implemented, and the pressures to realize productivity improvements due to the threat of competition have had their effect. Accordingly, we do not expect further significant reductions in employment by the carrier industry during the rest of the decade. The interconnect industry is reaching maturity in Ontario and in the other provinces where terminal attachment is permitted, and growth will be slow.

Increases in employment are most likely in the area of new emerging services, like cellular, new types of mobile and paging services, and other enhanced or value-added services. Increasing sophistication of business users will also create employment opportunities within user firms. Finally, improving the competitive position of existing sectors of the industry, particularly the telecommunications manufacturing sector, will also have a positive impact on overall employment in the telecommunications industry.

INTRODUCTION

This section of the report contains a summary of the terms of reference, our working definition of the industry which was developed to respond to the terms of reference, and a description of the sources of historical data which were used in the study.

TERMS OF REFERENCE

The terms of reference stated the purpose of the study was to provide and analyze employment information and data in the telecommunications carrier, manufacturing and related industries for the last decade. Specifically, the terms of reference required the study to include:

1. An historical description of employment patterns and trends in the telecommunications sector for the last decade, comparing national and Ontario data.

2. Estimated impacts of major policy and regulatory decisions on employment in this sector.

3. Identification and analysis of other major events or factors that affected employment during the study period.

4. Future projections on expected employment in this sector.

DEFINITION OF THE INDUSTRY

The Canadian telecommunications industry, for purposes of this study, was defined as the regulated telecommunications carriers, the radio common carriers (RCCs), cellular and other mobile service providers, enhanced service providers, the manufacturers and distributors of voice and data telecommunications equipment for use by carriers (both terrestrial and satellite) and subscribers, and the terminal supply and service, or interconnect, industry. Also included in our study were related segments of the communications industry, including the cable television industry and the radio and TV broadcasting industry.

An increasingly important segment of the telecommunications industry is the in-house operation and management of voice and data telecommunications facilities. While precise statistics on employment in this category were not available, we utilized a survey technique to arrive at an estimate.

This definition of the industry also raised issues with respect to the manufacturers of data processing and related equipment. In a world in which telecommunications and data processing both employ digital technology and make extensive use of software in the operation of equipment, it is often difficult to distinguish between telecommunications and data processing. For purposes of this study, we limited our purview of the data processing industry to those aspects of the data processing industry which relate to the carriage of data, as opposed to the processing of data.

SOURCES OF DATA AND APPROACHES TO RECONCILIATION

Sources of data which were used for the primary employment statistics, and the secondary statistics on revenues, construction programs, imports and exports, manufacturers' shipments included various catalogs from Statistics Canada, the Canadian Occupational Projection System (COPS) of Employment and Immigration Canada, the annual reports of the major carriers, the Department of Communications' annual publication entitled "Financial Statistics on Canadian Telecommunication Common Carriers", surveys conducted by Angus Telemanagement Limited, and a number of other studies and reports. A complete list of sources is contained in Appendix A.

In collecting and analyzing the historical data from these sources, two approaches were used concurrently to ensure that the data was as reliable as possible. The first was the use of multiple lines of evidence whenever possible. This approach entails the use of data from independent sources, thus providing a high degree of confidence when definitions and data coincide. The second approach was the use of a top-down, bottom-up approach to the reconciliation of aggregate data. This second approach is particularly useful in resolving questions of definition.

HISTORICAL EMPLOYMENT DATA - ONTARIO AND CANADA

In this section, we provide the detailed employment statistics which were gathered in the initial phases of the study using the top-down, bottom-up approach to reconciliation of data from various sources, as described earlier. The main emphasis in the study was on the telecommunications carrier industry and the telecommunications manufacturing sector. However, because of the nature of the telecommunications sector which is often considered to include the broadcasting and cable TV industries, and because the Communications Division of the Ministry of Transportation and Communications also has responsibilities for these industries, we were asked to include employment statistics on these sectors as well.

THE TELECOMMUNICATIONS CARRIER INDUSTRY

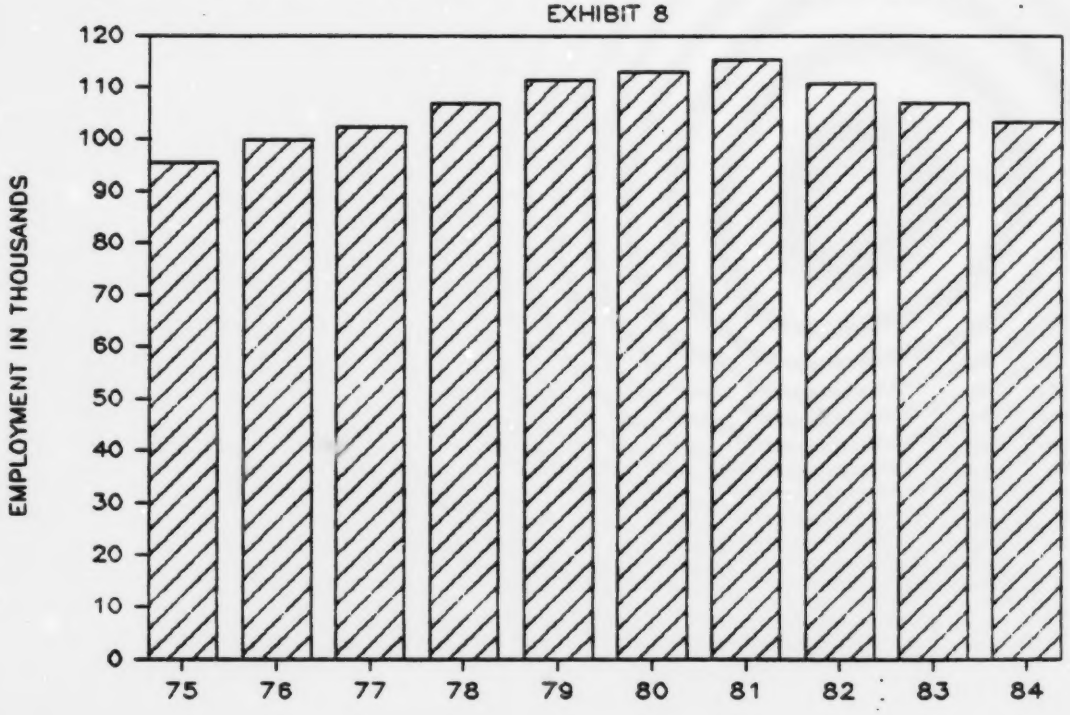
The telecommunications carrier industry in Canada includes the member companies of Telecom Canada, the independent telephone companies in Ontario, Quebec and Alberta, CNCP Telecommunications, Telesat Canada, Teleglobe Canada, the cellular carriers (Cantel and the telco cellular subsidiaries), the radio common carriers (RCCs) and the "interconnect companies" or PBX and terminal system sales and service companies. Also forming part of the telecommunications carrier industry are those contractors which are involved with the carriers in the continuing construction programs.

Precise employment statistics are available for most of the major carriers through their annual reports and through the Department of Communications' publication mentioned above which is based on the annual reports of the carriers. The sixteen largest carriers in Canada are included in this publication. The employment statistics for these sixteen carriers, which we estimate account for over 99 percent of the telco employment in Canada, are shown in Exhibit 8, overleaf, for the period 1975-1984.

The only carriers to be excluded are the small independent telephone companies in Ontario and Quebec. Based on information provided by the Canadian Independent Telephone Association and

EMPLOYMENT BY 16 LARGEST CARRIERS

EXHIBIT 8



the annual report of the Ontario Telephone Service Commission, we estimate employment by the small independents is currently approximately 800. Historical statistics for the independent telephone companies were not available.

Overall statistics for the industry in Canada and Ontario were obtained from the COPS database. With the exception of the 1980 national figure which was inexplicably low, the COPS employment data could be reconciled with national and Ontario data. Survey-based employment figures were obtained from Angus Telemanagement Limited for the interconnect industry in Ontario and Canada. Statistics Canada outside construction data was combined with telco construction program information to estimate the employment by outside contractors serving the telecommunications industry. Estimates were obtained from industry sources for the cellular industry. The only significant question is the employment by the radio common carrier industry, which includes both mobile services and telephone answering services. However, they are assumed to account for the balance of the COPS industry category "Telephone and Telegraph".

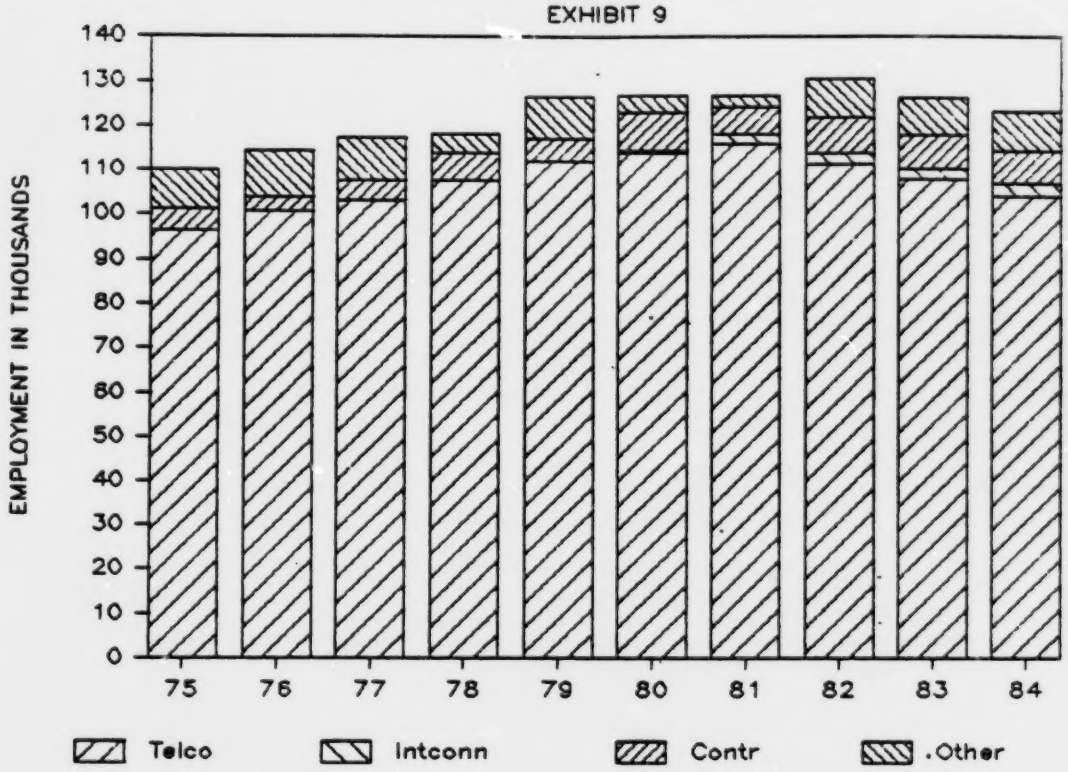
Statistics Canada employment data for the telecommunications industry was rejected for purposes of this study because the employment numbers reported, including both full-time and part-time employees, was less than the employment reported in the annual reports of the major telcos. No explanation was available for this apparent discrepancy.

The COPS data provides national and Ontario employment figures for the period 1975 to 1983. Adjusting the inexplicably low 1980 national figure, and using bottom-up estimating procedures for the 1984 figures, we developed the historical series shown in Exhibits 9 and 10, overleaf, for Canada and Ontario. Because of the uncertainty with respect to the radio common carrier data, we have included the radio common carriers with cellular carriers in the category "other".

For Ontario, the makeup of the telecommunications carrier sector in 1984 was as follows: Bell Canada accounted for approximately 75 percent of the employment, with Northern Telephone, CNCP, Telesat and the 31 small independent telephone companies representing another 8 percent. The interconnect

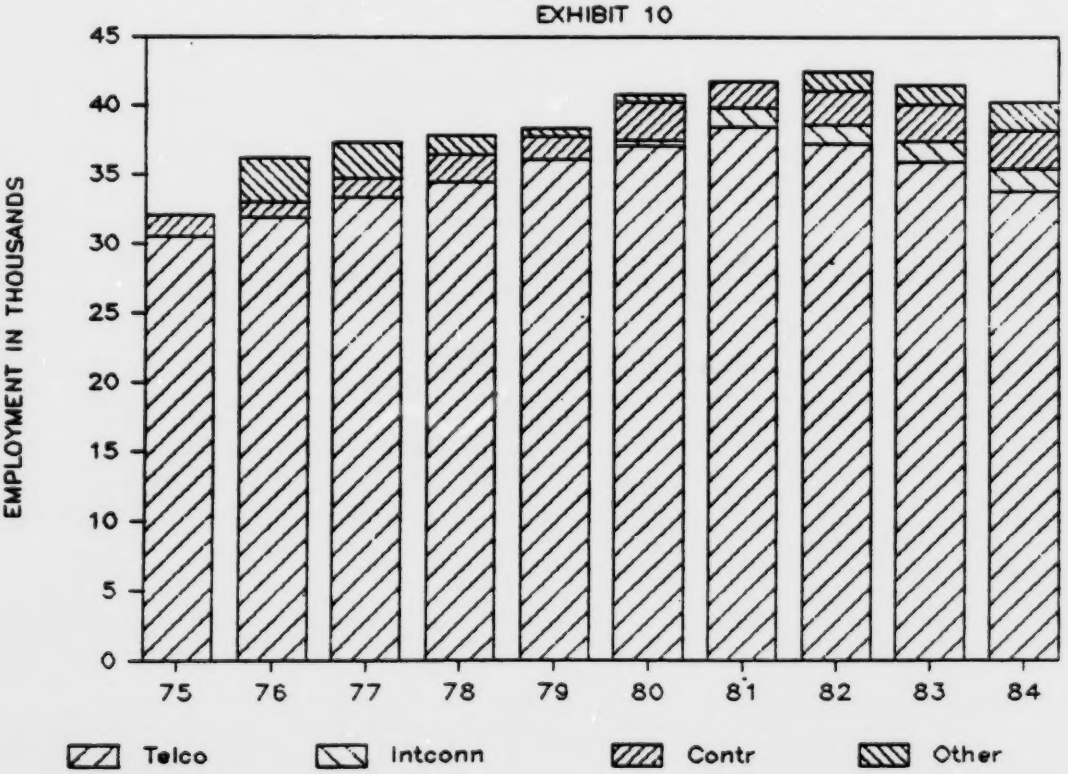
EMPLOYMENT — CANADA

EXHIBIT 9



EMPLOYMENT — ONTARIO

EXHIBIT 10



industry accounted for approximately 4 percent. The remaining 13 percent of employees in Ontario were employed by the RCCs, by the cellular industry, and by outside contractors engaged in construction for the carriers.

THE TELECOMMUNICATIONS MANUFACTURING INDUSTRY

Understanding the relationships between the various sectors of the telecommunications industry is an important aspect of a study of this nature. As Exhibit 11, overleaf, illustrates, these relationships have been changing in recent years. Until the late 1970's, the telecommunications carriers were the decision-makers in terms of the choice of facilities and equipment for the entire industry. The carriers made the determination of the facilities to be used, the technology involved, the specifications and the quality. As a result, there was very little interaction between the manufacturer and the end-user.

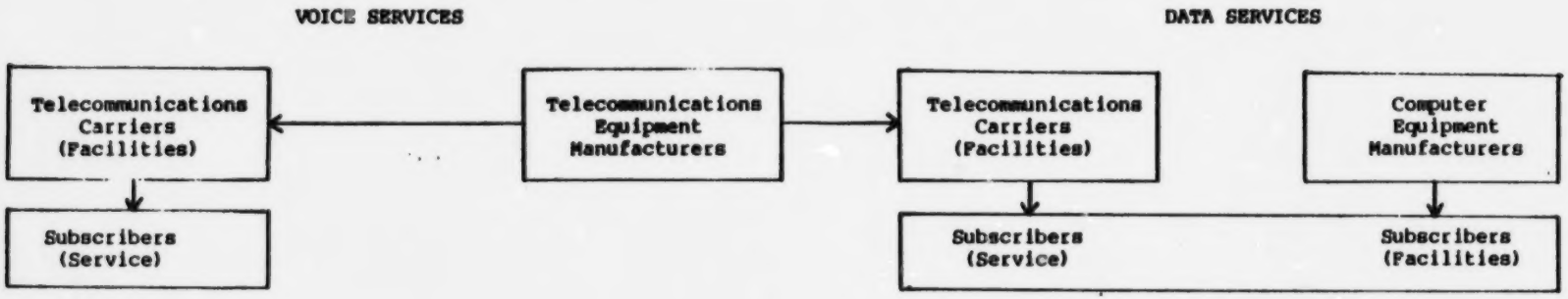
With liberalization of terminal attachment policies at the federal level, some changes in the method of providing service began to take place, including the initiation of a user-manufacturer interface for selected portions of the telecommunications business.

Continuing advances in technology increased the ability of users to manage their own operations and led to a tendency for users to lease facilities from carriers to provide their own end-to-end services. An increase in the number of private networks and new enhanced or value-added services from non-traditional suppliers of telecommunications services was the result. At about this time, and for some of these same reasons, users began to integrate voice and data services to realize better overall efficiency of operation. The result has been a blurring of the traditional distinction between manufacturers of telecommunications equipment on the one hand, and computer equipment manufacturers on the other. The use of similar digital technologies has both contributed to and resulted from this integration.

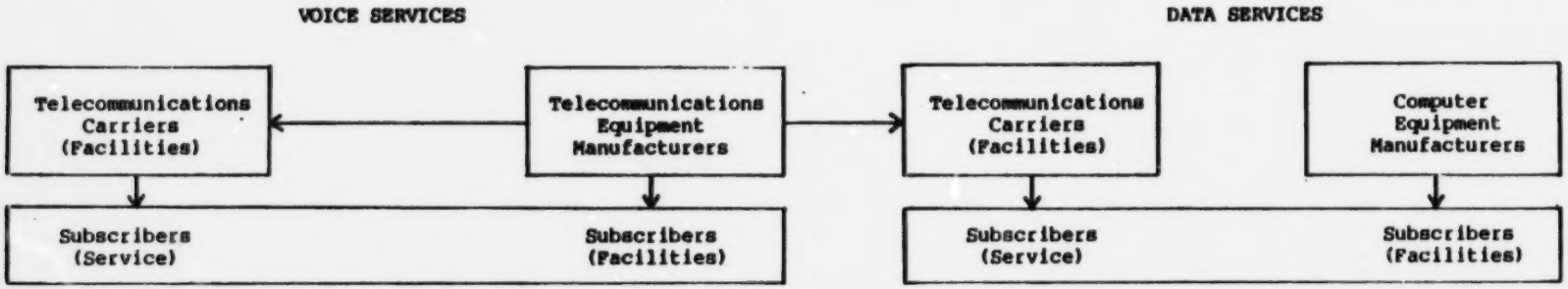
EXHIBIT 11

CHANGING RELATIONSHIPS WITHIN THE TELECOMMUNICATIONS INDUSTRY

TRADITIONAL 1970'S INDUSTRY STRUCTURE



POST TERMINAL ATTACHMENT INDUSTRY STRUCTURE



TODAY'S INDUSTRY STRUCTURE WITH INTEGRATION OF VOICE AND DATA

VOICE AND DATA SERVICES

Telecommunications Carriers (Facilities)
Telecommunications Equipment Manufacturers
Computer Equipment Manufacturers
Subscribers Voice and Data Services and Facilities
New Entrants Providing Enhanced Telecom Services

The Canadian telecommunications manufacturing sector is dominated by Northern Telecom and a few other firms, such as Microtel and Mitel, which have broad product lines and compete on world markets. This group is heavily dependent on export markets for its growth. The nature of the products with which members of the group are involved requires heavy investments in research and development, in advanced manufacturing techniques and in dedicated manufacturing facilities. These investments can only be recovered through sales volumes which the domestic market cannot support. Accordingly, these firms must maintain a strong competitive position in world markets.

The rest of the sector is characterized by smaller firms which are more specialized and tend to produce primarily for the Canadian market. While the products which these companies produce are not necessarily less sophisticated, the investments in research and development, manufacturing techniques and plant are proportionately smaller. Generally speaking, these smaller manufacturers tend to build on their expertise in a relatively narrow segment of the market, and rely on close contact with the telecommunications carriers to become aware of opportunities. Their plant is more flexible in terms of the range of products which can be produced, and they can adapt their facilities and products to bring small volumes of new products to market quickly.

All the major manufacturers of telecommunications equipment, including Northern Telecom, Microtel and Mitel, have extensive manufacturing facilities in Ontario. In addition, an additional 125 firms, all or much of whose products are used in or by the telecommunications industry, manufacture in Ontario. The publication "Made in Ontario", supplemented by other sources of information, gives an indication of the range of sizes of these firms. Of the 128 firms in this category, a full 50 percent have 25 or fewer employees. Of the remainder, another 20 percent have less than 100 employees. Only nine firms employ more than 500 in Ontario.

For the telecommunications manufacturing sector, we elected to use Statistics Canada employment data for SIC 335 for Canada and Ontario. In order to ensure that the employment numbers were consistent with our proposed definition of the industry, we

conducted a detailed company-by-company estimate of employment for the industry in Ontario. The results were within three percent of the Statistics Canada employment figure for SIC 335 in Ontario. Accordingly, while the definitions may be somewhat different, we have confirmed the reliability of the data at the provincial level and therefore accept the national figures as well.

The employment data for the telecommunications manufacturing sector for Canada and Ontario over the period 1975 to 1984 are contained in Exhibits 12 and 13, overleaf.

CABLE TELEVISION, RADIO AND TV BROADCASTING

Statistics Canada employment data for the cable TV industry was found to be consistent with COPS data for the industrial category "Radio and TV Broadcasting" when combined with the data for the radio and TV broadcasting industry. The employment figures for the cable TV sector for Canada and Ontario are illustrated in Exhibits 14 and 15, overleaf.

Exhibits 16 and 17, overleaf, contain the employment data for the radio and TV broadcasting industry.

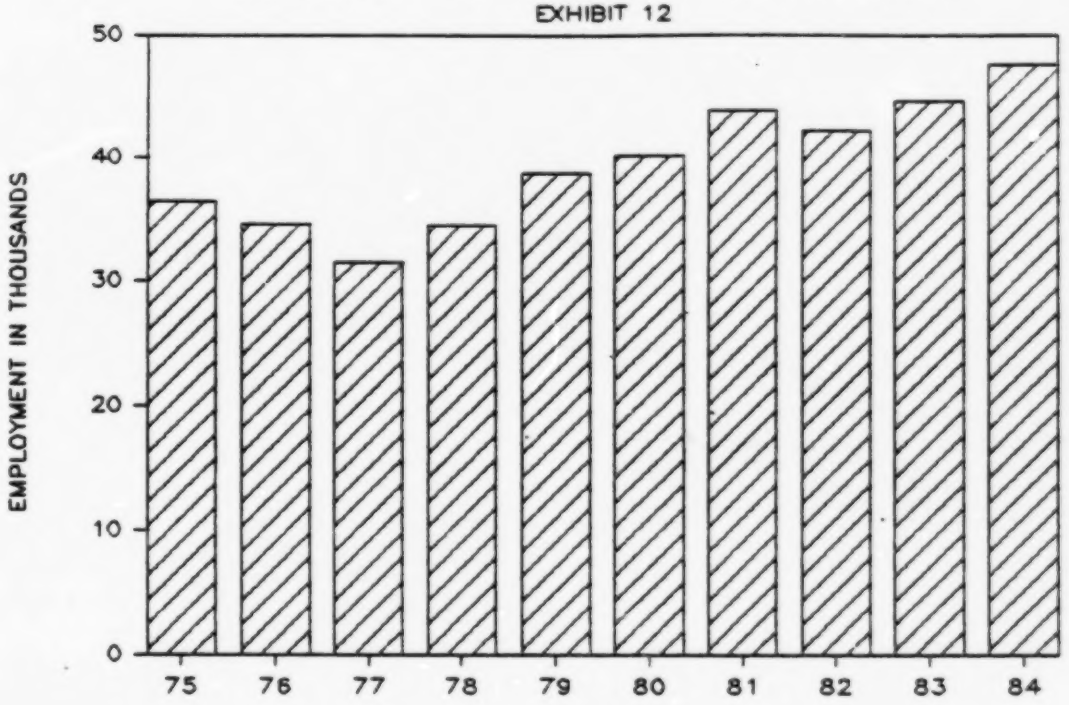
EMPLOYMENT IN SECTORS RELATED TO THE TELECOMMUNICATIONS INDUSTRY

Another important source of increasing employment in the telecommunications industry is the user community. That is, the employment by major telecommunications users of in-house specialists for the administration and management of the telecommunications voice and data function.

Data from firms accounting for approximately $275 million in annual telecommunications expenditures employed 615 people in various capacities related to the telecommunications function. There appeared to be a threshold around the $500 thousand per year mark below which no particular individual had this responsibility. Above that level, the average employment among

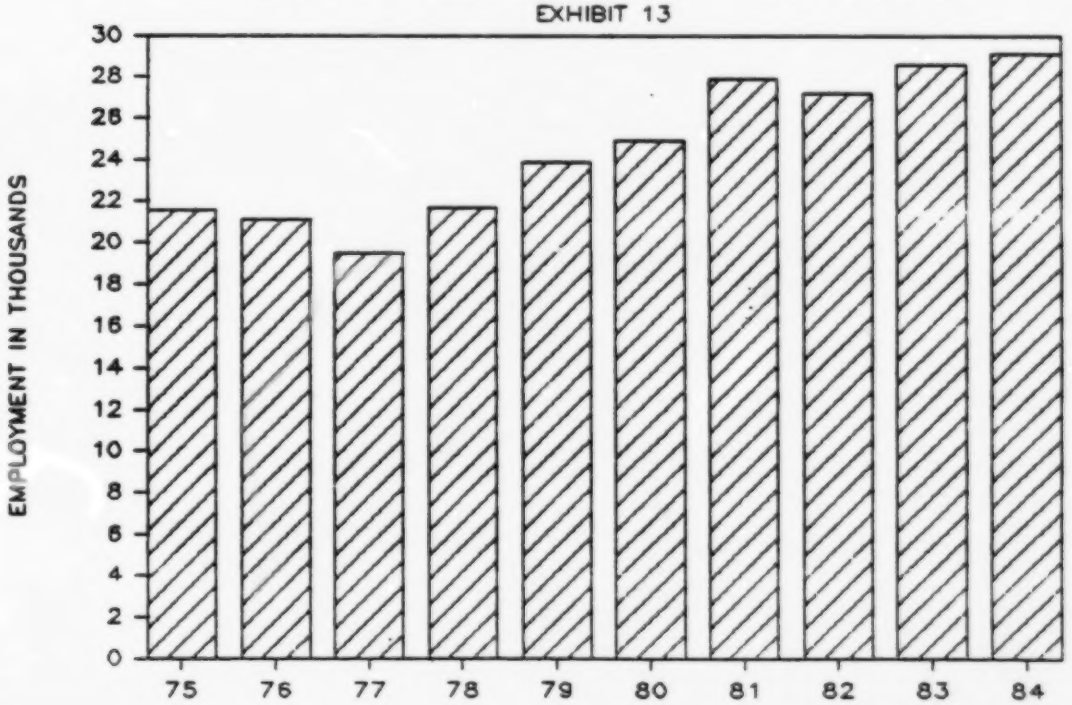
MANUFACTURING — NATIONAL

EXHIBIT 12



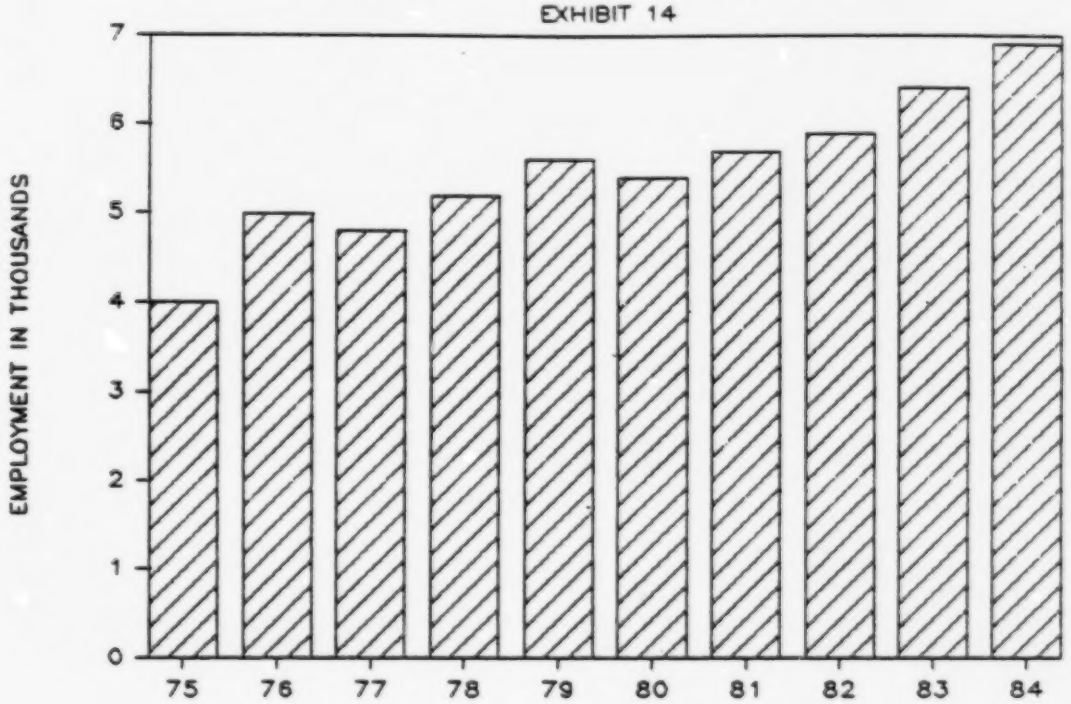
MANUFACTURING — ONTARIO

EXHIBIT 13



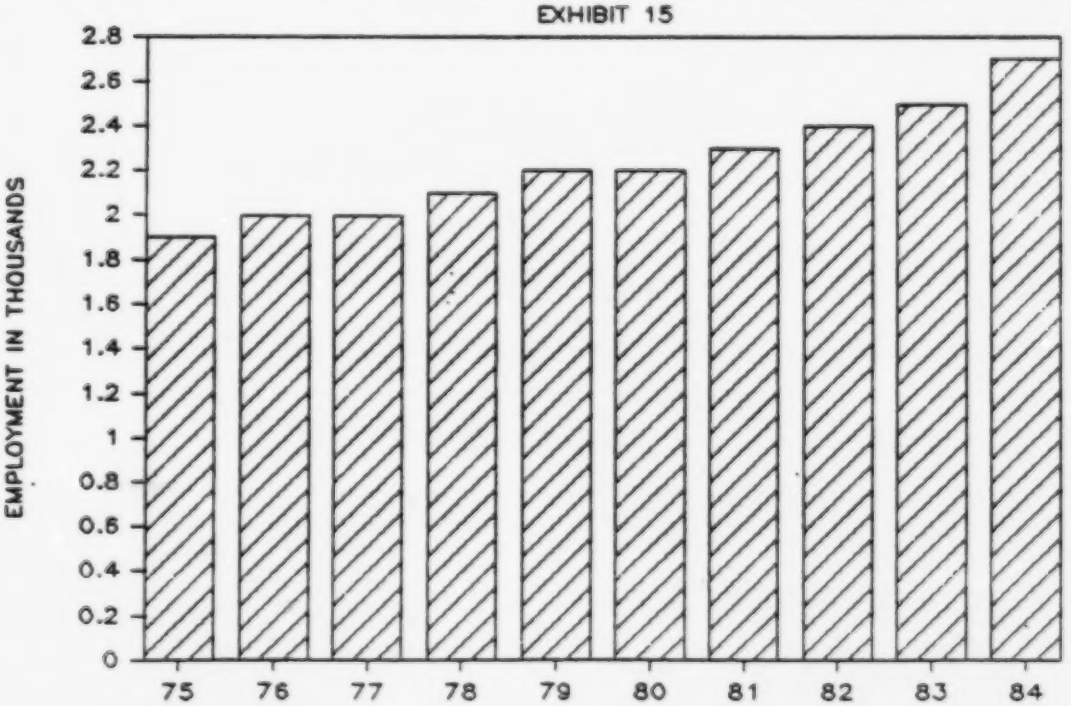
CABLE TV — NATIONAL

EXHIBIT 14



CABLE TV — ONTARIO

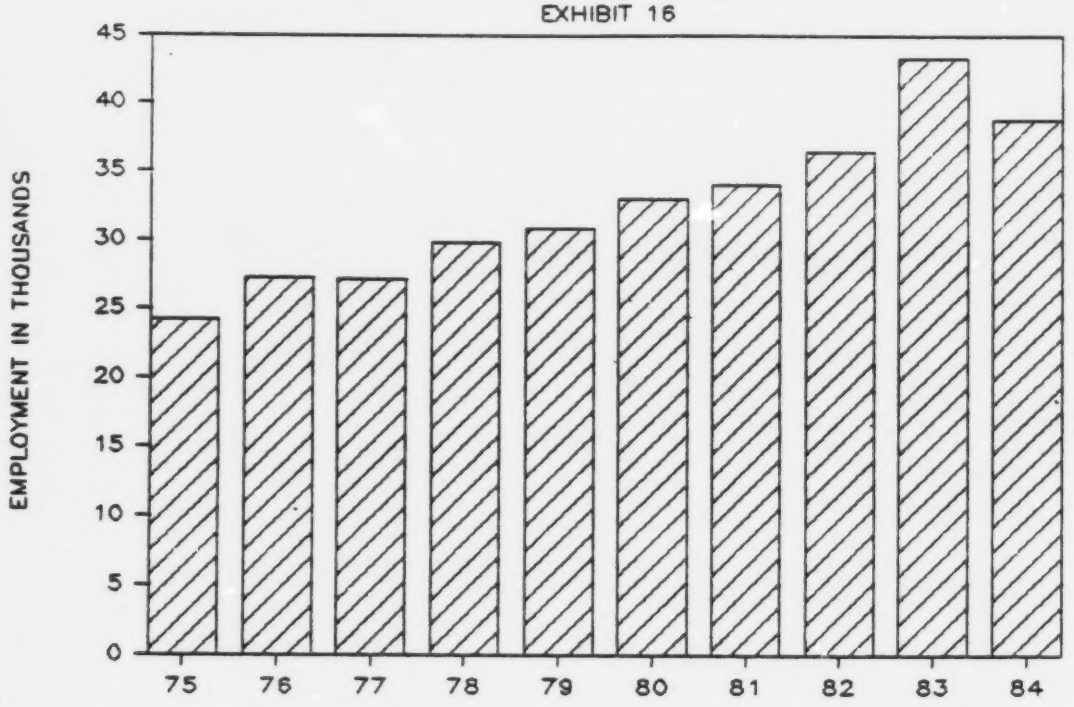
EXHIBIT 15



the companies interviewed was one employee for every $450 thousand in annual telecommunications expenditures, although the number varied widely across the sample. On this basis, we estimate that total employment by users across Canada is approximately 5,000, of which about 2,000 are in Ontario.

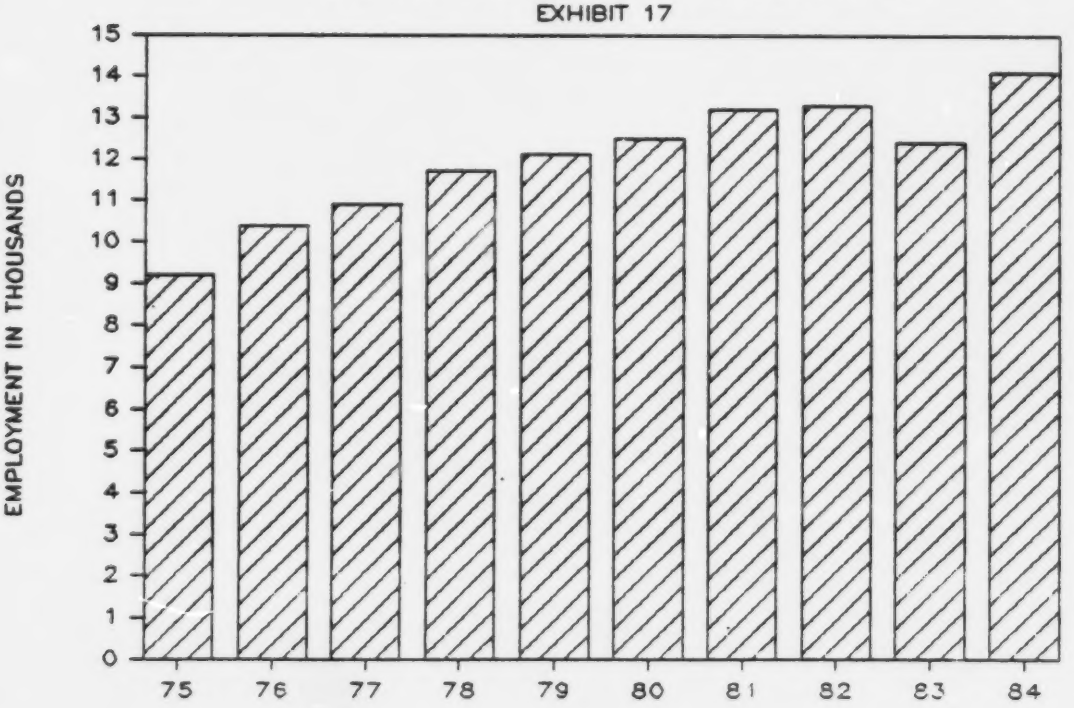
RADIO & TV — NATIONAL

EXHIBIT 16



RADIO & TV — ONTARIO

EXHIBIT 17



THE ENVIRONMENT OF THE TELECOMMUNICATIONS INDUSTRY

In this section of the report, we describe the environment within which the telecommunications industry operates. In particular, we describe the changes in the regulatory and economic aspects of the environment of the industry during the past decade.

THE REGULATORY ENVIRONMENT

During the early part of the past decade, regulatory activities were primarily concerned with rate adjustments. At the federal level, responsibility for telecommunications regulation was shifting from the Canadian Transport Commission to the Canadian Radio-television and Telecommunications Commission (CRTC). Bell Canada, B.C. Tel, CNCP Telecommunications and the predecessors to NorthwesTel and Terra Nova Tel were making rate applications on an annual basis. For the most part, these rate increase requests were approved, with most changes taking place through the roll-back of requests for increases in basic service rates.

In 1979, a significant decision from an industry structure point of view was rendered when CNCP was granted dial-up interconnection with Bell Canada for certain private line services. In late 1981, CNCP obtained similar interconnection rights with B.C. Tel.

The Bell Canada interim terminal attachment decision of August, 1980, was extremely significant for a number of specialized firms in the industry. This decision was later made final, with elimination of the requirement to lease even the main set from the carrier, and was extended to B.C. Tel as well.

In June of 1982, the federal government announced 6% and 5% rate restraint guidelines for federally regulated carriers. In February of 1984, the restraint program was extended with 4% guidelines. These rulings largely eliminated the annual rate hearings for federally regulated carriers.

The Bell Canada reorganization, which resulted in Bell Canada becoming a wholly-owned subsidiary of Bell Canada Enterprises, was examined by the CRTC and its report to the government was issued in April 1983.

Regulatory proceedings in other parts of Canada and in the U.S. can also have an impact on employment in the telecommunications industry in Canada and Ontario. Terminal attachment was approved recently in several other provinces, including Alberta and Nova Scotia. Significant for the manufacturing sector was the AT&T divestiture, by which AT&T agreed to divest of its holdings in the Bell operating companies throughout the U.S. This agreement provided opportunities for Canadian manufacturers to supply these operating companies with telecommunications equipment.

THE ECONOMIC ENVIRONMENT

For the telecommunications industry, two aspects of the economic environment are significant. The first of these is the general health of the economy, for which the Gross National Product (GNP) and total employment figures are commonly used measures. The second is the import/export situation, or balance of trade.

Gross National Product and Total Employment

Historical GNP figures are presented in Exhibit 18 which follows Page 17. These figures are adjusted for inflation (1971=100). The adjusted or constant dollar figures are used since they more accurately reflect the real growth in the economy.

The historical growth rate for the Canadian GNP over this period was approximately three percent. The rate of growth was determined by a simple time trend analysis, removing the effect of the 1982 recession with an intervention variable. This was done to avoid the lower growth rate estimate that would be obtained if the decrease of 7.5 percent in 1982 was averaged with the increases recorded in other years.

Another measure of economic conditions is the number of persons employed. The statistics on total employment provide an important reference for comparing the employment patterns in the telecommunications sector. The total employment statistics for Canada are presented in Appendix B. Of particular significance is the relative employment by the telecommunications carriers, as illustrated in Exhibit 19, overleaf. The estimated annual growth rate, adjusting for the recession, was approximately 2.9 percent. Unlike the GNP, total employment in the post-1982 period appears to be increasing at a lower rate than in the years prior to 1982.

While Exhibit 19 illustrated the declining employment by the sixteen largest telecommunications carriers relative to the growth in total employment for Canada, Exhibit 20, overleaf, places employment in the entire communications industry (telecommunications, cable, radio and TV broadcasting and telecommunications equipment manufacturing) in this same perspective. While the trend in this case is more cyclical, it also indicates relative growth over time.

Imports and Exports of Telecommunications Equipment

Over the last decade, Canada improved its balance of trade in the telecommunications industry as exports continued to rise dramatically relative to a gradual increase in imports. Since 1975, Canada's balance of trade in the telecommunications sector went from a deficit of 5 million dollars to a surplus of 630 million dollars in 1984.

Exports began to show a marked improvement over imports starting in 1978. While imports continued to grow at an annual rate of eight to nine percent a year starting in 1975, exports increased at the rate of thirty percent a year. Exports continued to expand at the same rate until the end of 1981 when the effects of the worldwide recession flattened demand. Imports showed the effects of the recession sooner, with decreases in 1981 as the manufacturers trimmed their inventories in anticipation of the decrease in world demand and to avoid paying excessive carrying charges when interest rates were at their peak.

EXHIBIT 18

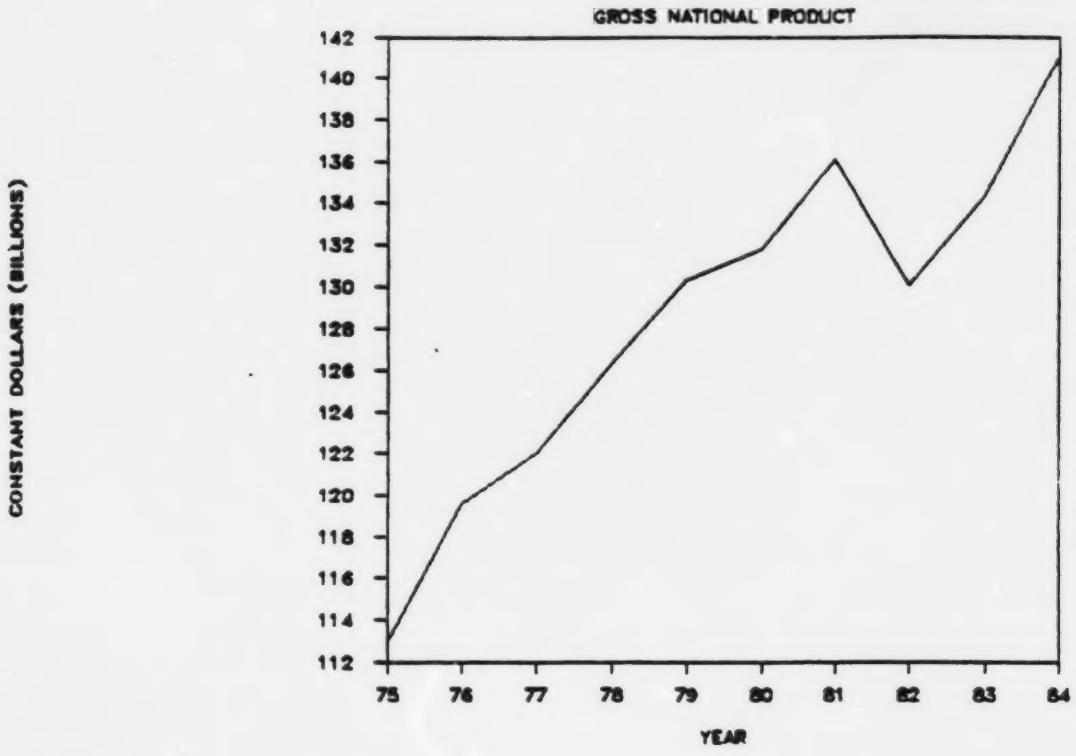
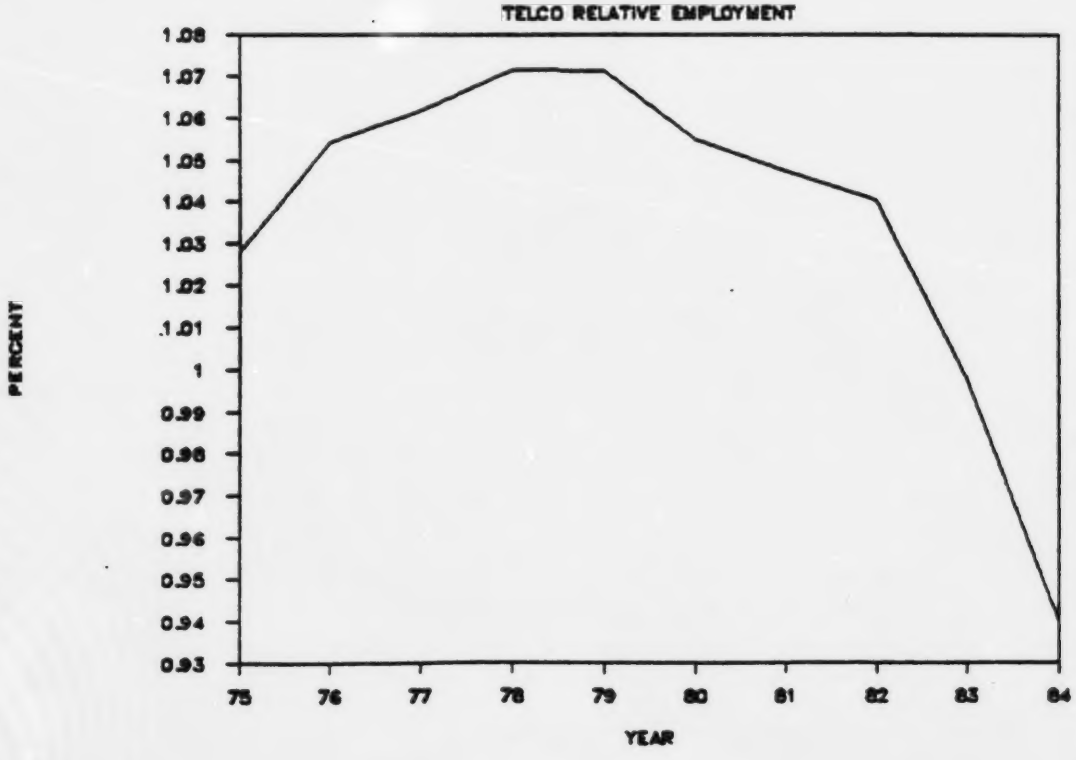
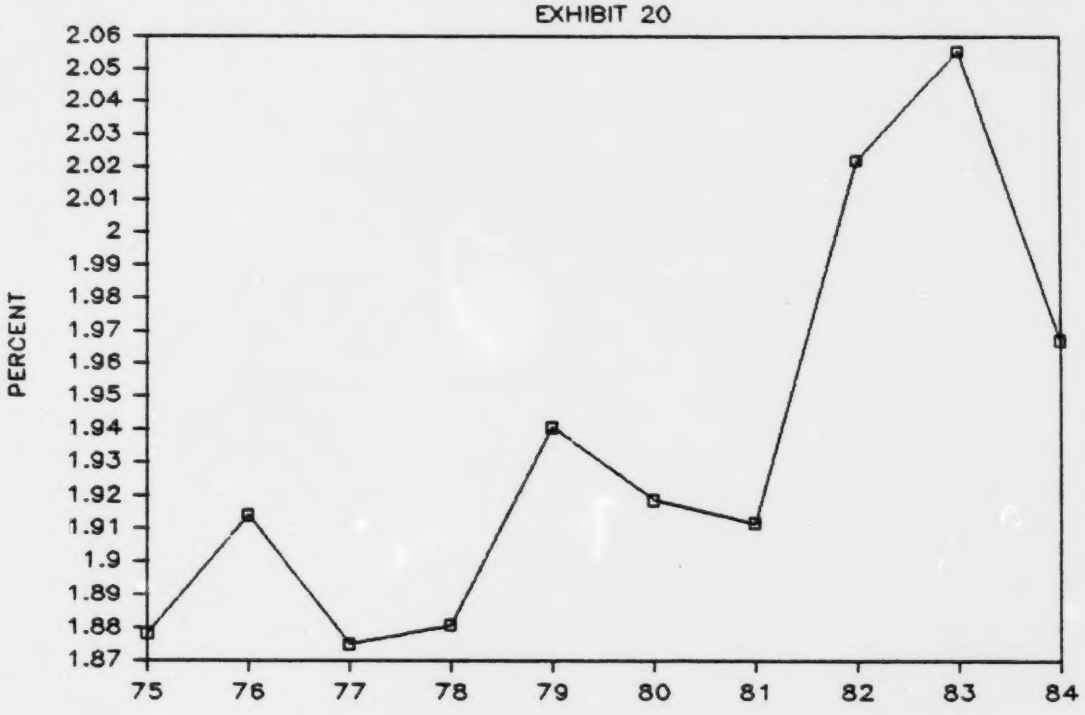


EXHIBIT 19



COMM. IND. RELATIVE EMPLOYMENT

EXHIBIT 20



By the end of 1982, the industry appeared to recognize that the economic picture was going to improve and began to prepare for a dramatic rise in world demand. Manufacturers increased their spending on imports by twenty percent in 1982. With the sudden drop in interest rates, export sales took off, rising by thirty-five per cent in 1983. It should be noted, however, that part of the increase in 1984 was due to a multi-million dollar sale of satellite equipment to Brazil. Sales of this nature are to be expected in the course of events, particularly when export conditions are favourable, less so when they are not.

Trend analysis of imports over the ten year period from 1975 to 1984 shows that the United States had 80% of the Canadian import market in 1975, followed by Japan which had less than 10%, Germany and West Britain which made up most of the difference. By 1984 the U.S. market share had fallen to 62% while Japan's share rose to 28%, mostly at the expense of other countries exporting to Canada.

Canada's exports, on the other hand, are broadly distributed among all nations of the world except for the United States. It continues to be the principal buyer of our goods, averaging more than 50% of all purchases. Major deals with individual countries vary from year to year. In looking at the decade of export sales, there does not appear to be any pattern for Canadian sales abroad other than a continued dependence on the U.S. market as the primary export market for Canadian telecommunications products.

MAJOR INFLUENCES ON EMPLOYMENT IN THE INDUSTRY

In this chapter of the report, we provide the results of the quantitative and qualitative assessment of the factors which have had an impact on employment in the communications industry.

In the statistical analysis, both extrapolative and explanatory models were used to examine employment trends. In view of the relatively small number of data points (10 years of annual employment data for each sector), any apparently significant results must be viewed with some caution. However, when used as one part of an approach to the interpretation of data, these techniques can be very useful.

The description of the approach and the detailed results of the statistical analysis are contained in Appendix B. Because of the technical nature of the methodology, only a brief summary description of the results is provided here.

In order to benefit from the experience of a wide range of industry observers, we also conducted a structured interpretation exercise with a number of individuals, each of whom had a unique perspective on the industry. We met individually with representatives of carriers, lawyers, former regulators, union executives, public interest groups, industry association representatives and manufacturing executives. We asked these individuals to attribute changes in employment to whatever factors they felt were significant on a year-by-year basis over the period 1975-1984. Once participants had identified a factor as significant, we provided them with quantitative information to assist in assigning specific weights to the factors.

We also asked each one for a forecast for the period 1985-1990. In some cases, individuals chose to interpret only part of the data, such as the telecommunications or manufacturing data, and in some cases to provide a forecast on the same basis. We present the results of the interpretation on a sector by sector basis below, along with the statistical results. The forecasts are provided in the following chapter.

THE TELECOMMUNICATIONS CARRIER INDUSTRY

The statistical analysis used the employment data for the sixteen largest carriers rather than the more-inclusive COPS "Telephone and Telegraph" data for the national level because of the problem with the questionable data point in 1980. Reasonably successful extrapolative and explanatory models were developed for both national and Ontario carrier employment. Interestingly, GNP was not a good predictor. However, construction program expenditures were significantly correlated with employment. Intervention analysis also indicated that the Bell Canada Non-Urban Service Improvement (NUSI) Program resulted in a 2.9 percent increase in employment.

The interpretation panel attributed employment growth to a wide range of factors. Those mentioned most often and weighted most heavily included growth in demand, the increasing value of information and the terminal attachment decision.

The interpretation panel attributed declining employment, particularly in recent years, to increasing automation or efficiency in the industry, to general economic factors, to interest rates and to competition.

THE TELECOMMUNICATIONS MANUFACTURING INDUSTRY

Linear time trend models provided the best fit to both the national and Ontario telecommunications manufacturing data. Revenues provided the best fit for the explanatory model. The model for the national data suggests that a one percent increase in revenues will result in a 0.94 percent increase in employment.

From the interpretation panel, new technologies for use by the carrier industry was the most often mentioned factor affecting employment in the manufacturing sector.

CABLE TV, RADIO AND TELEVISION BROADCASTING

For statistical analysis purposes, the Cable TV and the radio and television broadcasting sectors were combined. Again, both extrapolative and explanatory models were developed. For the national figures, no significant explanatory variables were found, although GNP, revenues and net plant were tested. For Ontario data, a combination of revenues and net plant was found to be significantly correlated with employment.

The interpretation panel attributed most of the employment growth in this sector to the increasing number of licences. No strong reasons were suggested for variations in the radio and television broadcasting sector.

FORECAST OF EMPLOYMENT TRENDS

In this final chapter of the report, we provide forecasts of employment in the industry from several sources.

INTRODUCTION

Employment forecasts for the industry for Canada and Ontario were obtained or developed from three sources. The first source was the forecast based on the extrapolative and explanatory models developed as part of the statistical analysis of the historical employment data. The second source was the accumulation of the individual forecasts provided by the individual members of the interpretation panel. The third source was the Informetrica reference forecast which was disaggregated by Employment and Immigration Canada to the level of the COPS industry sectors. Unfortunately, the Informetrica forecast can only be used for the Telephone and Telegraph and Radio and TV Broadcasting sectors. The Electrical Products industry sector is too broad for our purposes.

DISCUSSION OF HISTORICAL TRENDS

In interpreting the historical data, most industry observers focused on recent declines in employment, particularly in the telecommunications carrier sector. Given the large proportion of employment by the carriers in the sector, such declines have a significant overall effect on the sector as a whole.

Significant also is that while absolute reductions in the telecommunications carrier industry have only occurred within the last three years, employment in the sector relative to total employment in Canada has been declining in relative terms for quite some time. This phenomenon was illustrated in Exhibit 19, although these declines are more than offset by growth in other sectors of the communications industry as indicated by the relative growth pattern in Exhibit 20.

It is interesting to note that competition appears to have had both positive and negative impacts employment. The CRTC's terminal attachment decisions, which created a competitive environment for the supply of terminal equipment in Ontario, Quebec and British Columbia, caused new firms to be created. These firms now employ some 3,600 nationally, 2,200 of which are in Ontario, and have total revenues of approximately $300 million. This industry was well developed prior to the decline in employment by the major carriers, which began in 1983. Therefore competition in terminal attachment appears to have had a positive impact on employment. However, competition or the threat of competition is also considered to have provided the motivation for carriers to implement major changes in technology and to seek productivity improvements, thus becoming more capital intensive and less labour intensive.

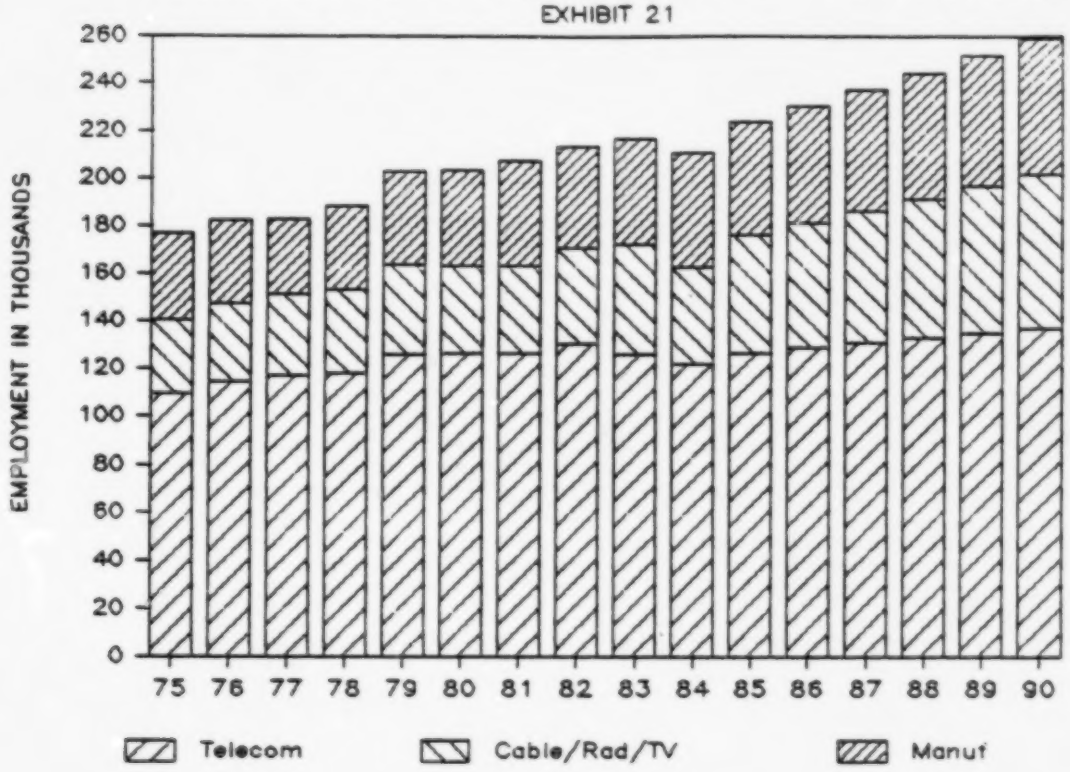
DISCUSSION OF FUTURE TRENDS

The average of the statistical forecasts developed as part of the statistical analysis indicated significant increases in employment in all sectors of the communications industry over the 1985-1990 period, reaching a level of 259,000 at the end of the period for the Canadian industry. For Ontario, the 1990 employment figure was forecast to be 103,000. These represent increases over 1984 employment levels of 19 percent and 11 percent, respectively. These forecasts, broken down into the three categories of telecommunications, cable/radio/TV and manufacturing are illustrated along with the historical data in Exhibits 21 and 22, overleaf, for Canada and Ontario.

By contrast, the panel of experts predicted, on average, a level of employment of 218,000 nationally and 94,000 for Ontario in 1990. Employment by the telecommunications industry was forecast to continue declining over the period, with increases taking place mainly in the manufacturing sector. Overall, the panel predicted a decline of 0.4 percent nationally, and an increase of 1.5 percent for Ontario. These averages of the individual forecasts for Canada and Ontario are provided in Exhibits 23 and 24, overleaf.

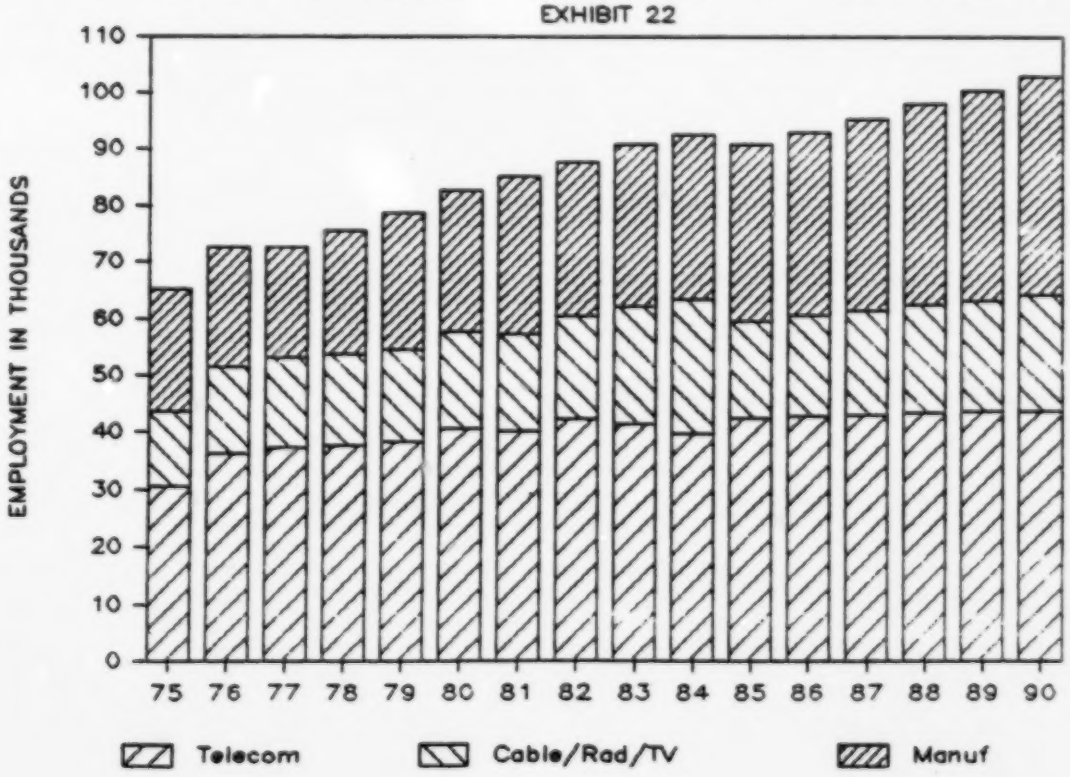
STATISTICAL FORECAST — NATIONAL

EXHIBIT 21



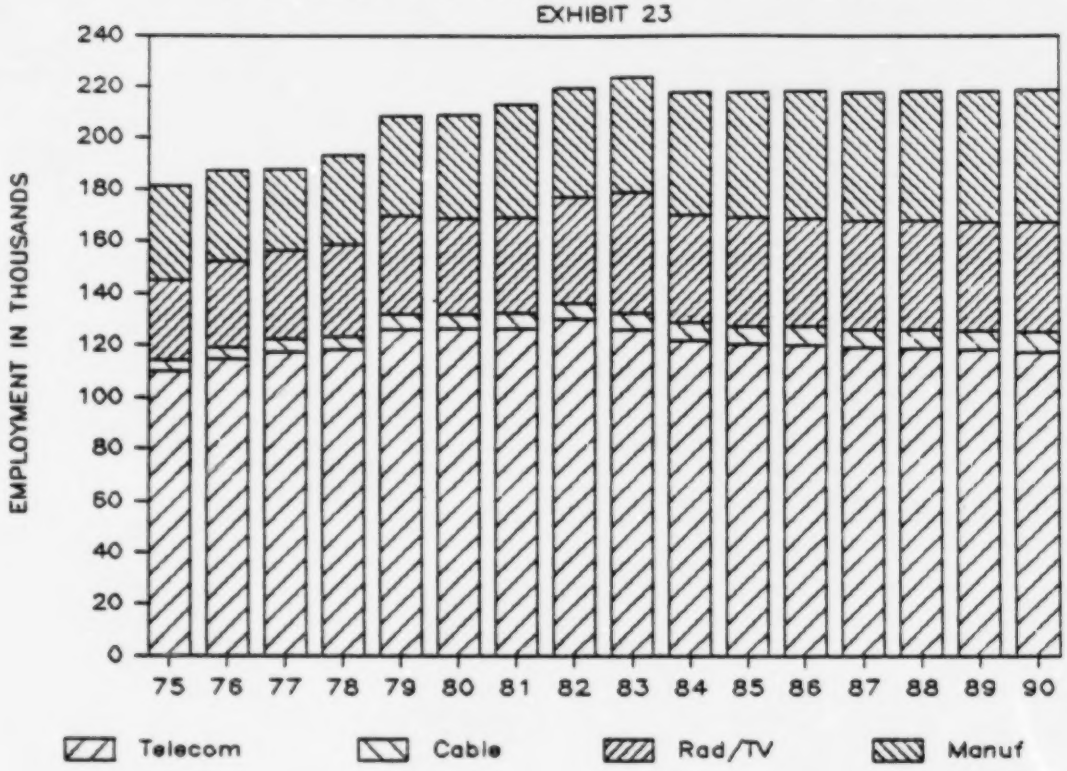
STATISTICAL FORECAST — ONTARIO

EXHIBIT 22



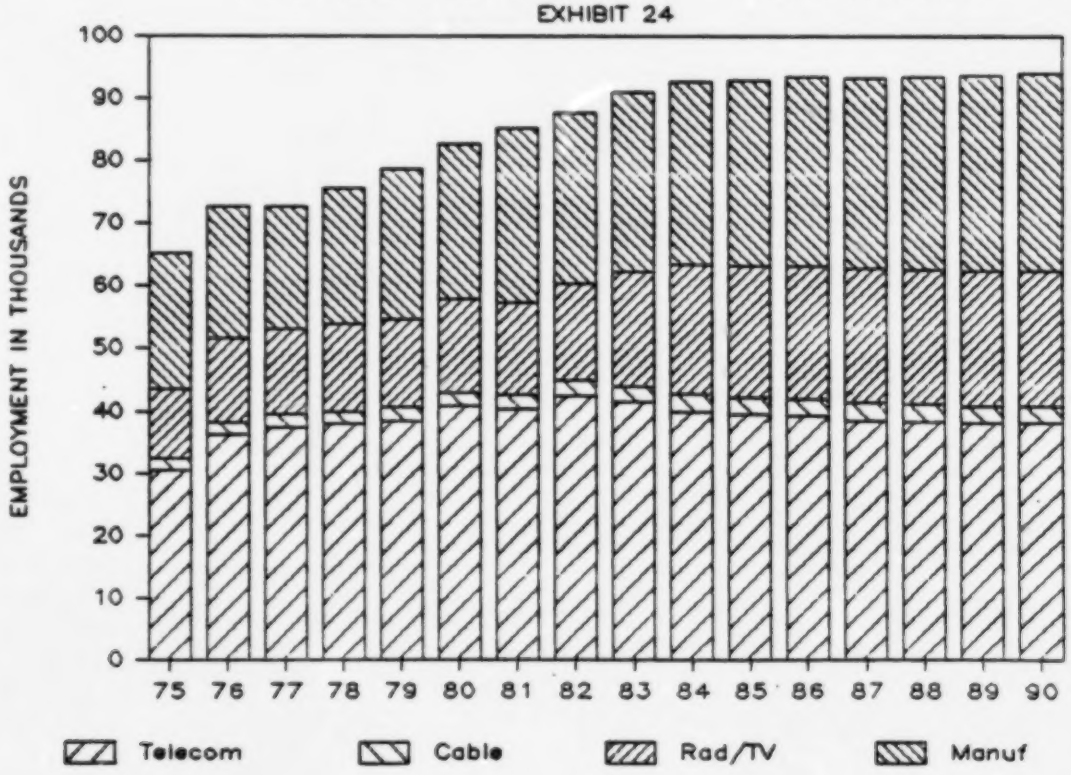
PANEL FORECAST — NATIONAL

EXHIBIT 23



PANEL FORECAST — ONTARIO

EXHIBIT 24



Finally, the Informetrica reference forecast disaggregated by Employment and Immigration Canada is provided in Exhibits 25 and 26, overleaf. Like the statistical models developed during this study, and unlike the predictions made by knowledgeable industry observers, the Informetrica reference forecast estimates a significant increase across all sub-sectors between now and 1990.

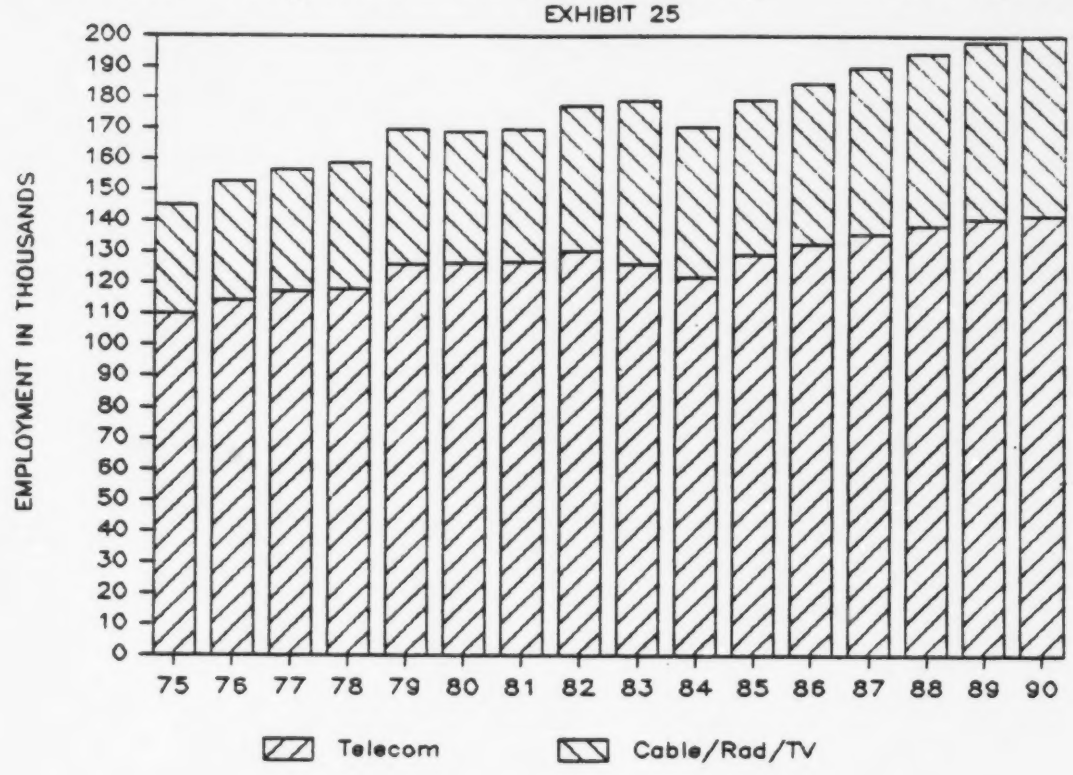
It is beyond the ability of extrapolative and explanatory models to take gradual structural changes into account. The implementation of new technologies has, for the most part, been gradual. Digital switching has been phased in beginning in the late 1970's. More automated repair services, such as remote line testing, have also been implemented over time. Intervention analysis of the type used in this study requires a significant shock before it becomes observable.

Our own view, based on a review of historical trends, discussions with members of the panel, and our knowledge of the industry, is that the telecommunications carrier industry will become increasingly more capital intensive, and therefore less labour intensive. However, we feel that the major changes in technology which have a negative impact on employment have already been implemented, and the pressures to realize productivity improvements due to the threat of competition have had their effect. Accordingly, we do not expect further significant reductions in employment by the carrier industry during the rest of the decade. The interconnect industry is reaching maturity in Ontario and in the other provinces where terminal attachment is permitted, and growth will be slow.

Increases in employment are most likely in the area of new emerging services, like cellular, new types of mobile and paging services, and other enhanced or value-added services. Increasing sophistication of business users will also create employment opportunities within user firms. Finally, improving the competitive position of existing sectors of the industry, particularly the telecommunications manufacturing sector, will also have a positive impact on overall employment in the telecommunications industry.

INFORMETRICA REFERENCE — NATIONAL

EXHIBIT 25



INFORMETRICA REFERENCE — ONTARIO

EXHIBIT 26